

REMARKS

Reconsideration and allowance of the present patent application based on the following remarks are respectfully requested.

By this Response, no claims are amended, added or cancelled. Accordingly, after entry of this Response, claims 1-13 and 16-20 will remain pending in the patent application.

Claims 1, 4, 13 and 16 were rejected under 35 U.S.C. §102(b) based on Nishi *et al.* (U.S. Patent No. 5,991,009) (hereinafter “Nishi”). The rejection is respectfully traversed.

Claim 1 recites a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Despite the Office Action’s assertions, there is nothing in Nishi that remotely discloses, teaches or suggests *each and every limitation* of claim 1, including the features identified above. Respectfully, the Office Action’s bases for the rejection are inadequate as they appear to ignore the claim language on its face.

For example, the Office Action indicates that the cited portions of Nishi disclose, teach or suggest an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Specifically, the Office Action asserts that “further interpretation, the aperture stop allows certain light rays to pass through. Therefore, the resulting passing rays correspond to the redistributed intensity distribution and ...the number of source images is different in the vertical and horizontal regions (col. 10, lines 19-22), which correspond to asymmetry in the X or Y axes.” (See page 2 of the Office Action). Respectfully, this is a mischaracterization of the teachings of Nishi. Applicant wishes to remind the Examiner that “the identical invention must be shown in as complete detail as is contained in the ... claim.” (See MPEP § 2131, citing Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), emphasis added). MPEP § 2131 also indicates that “the elements must be arranged as required by the claim.” (See MPEP

§ 2131, citing In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990), emphasis added). The cited portions of Nishi do not meet these requirements.

Unlike claim 1, the cited portions of Nishi (element 8 and col. 8, lines 16-17 and col. 10, lines 9-14) merely disclose an aperture stop 8 having a circular aperture 8a. As explained in Applicant's Response of November 22, 2006 (hereinafter "Applicant's Response"), the aperture stop 8 is merely adapted to block parts of the light source images 22, 23, 24 that are created by the fly-eye lens 7. Thus, what the cited portions of Nishi do disclose is removing some of the light source images created by the fly-eye lens 7, *e.g.*, the light source images located at the corners of the fly-eye lens 7. (*See, e.g.*, FIG. 3b of Nishi). As such, by virtue of removing part of the light source images, the aperture stop 8 of Nishi is merely adapted to change the intensity distribution of radiation of the light source images created by the light source images so as to create a new intensity distribution. In so doing, the aperture stop 8 of Nishi does not, in any way, redistribute an intensity distribution exiting the reflective integrator, as required by claim 1. The word "redistribute" is defined as "distributing in a different way." (*See* Merriam Webster dictionary). The cited portions of Nishi do not disclose, teach or suggest these aspects, *i.e.*, do not teach distributing the intensity distribution of the light source images in a different way. The Examiner must realize that the intensity distribution after the aperture stop 8, which blocks radiation, does not correspond, in any way, to a redistribution of the intensity distribution.

Furthermore, even assuming *arguendo* that the cited portions of Nishi teach redistributing an intensity distribution, they simply fail to disclose, teach or suggest that the intensity distribution exiting the aperture stop 8 is such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. As shown in FIGS. 3b, 4 and 5 of Nishi, the light source images are symmetric with respect to both the X and Y axes. Thus, the Office Action's determination that Nishi teaches an asymmetric distribution with respect to the X or Y axis is simply incorrect.

Moreover, Applicant wishes to point out that the Examiner's statement "the number of source images is different in the vertical and horizontal regions (col. 10, lines 19-22), which correspond to asymmetry in the X or Y axes" is also incorrect. The mere fact that the number of light source images is different in the vertical and horizontal regions is not an indication, in and of itself, that the intensity distribution is asymmetric with respect to the X or Y axis. Respectfully, there is no correlation between the number of light source images and the asymmetry of the intensity distribution with respect to the X or Y axes. Even if the numbers of light source images in the vertical and horizontal regions are different, the

intensity distribution of the light source images could still be symmetric with respect to the X or Y axis. In support of this, the Examiner's attention is directed to FIGS. 3b, 4 and 5 of Nishi which show that the vertical and horizontal allocations of the light source images are symmetric with respect to the X and Y axes.

As another example, the Office Action continues to insist that the fly-eye lens 7 of Nishi is an optical integrator. The Office Action asserts that "as known in the art, a fly-eye lens is an optical integrator with internal reflections. Thus, this is broadly interpreted as a reflective integrator." (See page 2 of the Office Action). Respectfully, this is incorrect.

First, the Office Action's assertion is not in line with the Office's guidelines and policies. The Examiner is respectfully reminded that during patent examination, the words of the claims, as opposed to the words used in the applied references, must be "given their broadest reasonable interpretation consistent with the specification." (See MPEP § 2111.01).

Second, a fly-eye lens is clearly not "a reflective integrator," as alleged in the Office Action. A reflective integrator has a clear, precise and definite meaning known in the art. As explained in Applicant's Response, a reflective integrator is adapted to create a plurality of source points by reflection. (See, e.g., paragraphs 48-49 and FIG. 2 of the present application). This is in contrast with a fly-eye lens, which is a composite lens comprising an array or honeycomb of small lenses. Thus, a fly-eye lens is merely adapted to create a plurality of source points by refraction.

Third, the Office Action's allegation that "a fly-eye lens is an optical integrator with internal reflections" is incorrect. It is not clear what "internal reflections" the Examiner is referring to in the Office Action. In support of this, the Examiner's attention is directed to FIG. 2 and col. 9, lines 12-47 of Nishi which show the principle of operation of a fly-eye lens. As shown in FIG. 2, the lens elements 7a, b, c...are adapted to refract the beam of radiation that impinges on the fly-eye lens. Specifically, the lens elements 7a, b, c... are adapted to integrate the beam of radiation by refraction, not reflection.

Fourth, claim 1 recites a reflective integrator, not a reflective element. As explained at paragraph 6 of the present patent application, the principle of an integrator is based on the creation of a plurality of secondary radiation or virtual sources from a primary source. Thus, even assuming *arguendo* that a portion of the beam radiation that impinges on the fly-eye lens is reflected (which is not shown in Nishi) by the fly-eye lens, the Examiner must realize that this hypothetical reflection, in and of itself, does not make the fly-eye lens a reflective integrator because the fly-eye lens does not integrate the impinging beam of radiation, i.e., creates a plurality of secondary radiation or virtual sources, by reflection.

For at least these reasons, it is respectfully submitted that claim 1 is patentable over the cited portions of Nishi.

Claim 4 is patentable over the cited portions of Nishi at least by virtue of its dependency from claim 1, and for the additional features recited therein.

Claim 13 is patentable over the cited portions of Nishi for at least similar reasons as provided above in connection with claim 1. Namely, claim 13 is patentable over the cited portions of Nishi at least because this claim recites an illumination system including a reflective integrator disposed along an optical axis, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Similarly, claim 16 is patentable over the cited portions of Nishi for at least similar reasons as provided above in connection with claim 1 and for the features recited therein. Namely, claim 16 is patentable over the cited portions of Nishi at least because this claim recites a lithographic apparatus comprising, *inter alia*, an illumination system configured to condition a beam of radiation, wherein the illumination system comprises a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes, and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 4, 13 and 16 under 35 U.S.C. §102(b) based on Nishi are respectfully requested.

Claims 1-3 and 13 were rejected under 35 U.S.C. §103(a) based on Mori (U.S. Patent No. 6,337,734) in view of Bowron *et al.* (U.S. Patent No. 6,205,271) (hereinafter “Bowron”). The rejection is respectfully traversed.

Claim 1 recites a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and

arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Despite the Office Action's assertions, there is nothing in Nishi that remotely discloses, teaches or suggests *each and every limitation* of claim 1, including the features identified above. Respectfully, the Office Action's bases for the rejection appear to ignore the claim language on its face.

For example, the Office Action alleges that the cited portions of Mori disclose, teach or suggest an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Specifically, the Office Action asserts that "the beams that reflect off the mirror [located immediately after the optical unit] impinge the mask in another X and Y orientation prior to its orientation before reflection off the mirror." (See page 3 of the Office Action). The Office Action goes on to state "this is broadly interpreted as a redistribution of intensity that is asymmetric with respect to at least one of the X and Y axes." Respectfully, these arguments lack merit.

As explained in Applicant's Response, the mirror in Mori located immediately after the optical unit 7 clearly is not configured to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The mirror shown in Mori is clearly incapable of providing such redistribution. The Examiner's determination that the intensity of the radiation reflected off the mirror is asymmetric with respect to one of the X and Y axes does not have any support in the teachings of Mori and the principle of a mirror. As explained in Applicant's Response, *the mirror of Mori preserves symmetries in the intensity distribution with respect to the X and Y axes.* For example, any distribution that is symmetric with respect to the X and Y axes before impinging on the mirror of Mori, will remain symmetric with respect to those axes. In other words, the bundles of light rays coming out of the mirror in Mori maintain the same symmetry with respect to the X and/or Y axis as those bundles of light rays coming into the mirror in Mori.

Furthermore, and as conceded at page 6 of the Office Action, Mori fails to disclose, teach or suggest a reflective integrator having a rectangular cross-section. However, Applicant respectfully submits that there are additional claimed aspects that are absent in the cited portions of Mori. For example, the cited portions of Mori fail to even disclose, teach or suggest a reflective integrator. As discussed above, a fly-eye lens is clearly not a reflective integrator as claimed.

The cited portions of Bowron fail to remedy the deficiencies of Mori. The cited portions of Bowron merely disclose an optical integrator rod but are silent as to an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Thus, any proper combination of Mori and Bowron cannot result, in any way, in the invention of claim 1.

The Office Action alleges that “the test of obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one of the references. Rather, the test is what the combined teachings of the references would have suggested to those ordinary skill in the art.” (*See* page 3 of the Office Action). However, there is no valid rationale for combining the teachings of Mori and Bowron, nor has the Examiner answered the substance of Applicant’s arguments. The Office Action must realize that Applicant’s arguments presented in Applicant’s Response were not directed as to whether the features of Bowron could be bodily incorporated into the structure of Mori. Rather, Applicant’s arguments were clearly directed to the substantial differences between the claimed invention and the prior art, as well as the lack of motivation and the improper rationale for combining the teachings of Mori and Bowron.

The Office Action states that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the optical integrator of Mori by having a rectangular cross-section for at least the purpose of reducing the amount of reflections.” This alleged motivation for combining the teachings of Mori and Bowron lacks merit. As explained previously, a reflective integrator, such as the one shown in Bowron, is configured to internally reflect light from an illumination source to create a plurality of light source images. By contrast, a fly-eye lens, such as the one disclosed by Mori, creates a plurality of source points by refraction (as opposed to reflection). Thus, if one wanted to reduce the amount of reflection, as suggested in the Office Action, one would not use a reflective integrator, such as the one disclosed in Bowron, which obviously would only increase the amount of reflections compared to a fly-eye lens. In addition, the alleged motivation, “for at least the purpose of reducing the amount of reflections,” does not appear to have any relevance either to the claims or to the combination of Mori and Bowron and no evidence in any of the references is provided to support this conclusion. Thus, for at least this reason, the rejection of claim 1 based on Mori, Bowron and any proper combination thereof should be withdrawn.

Claims 2-3 are patentable over Mori, Bowron and any proper combination thereof at least by virtue of their dependency from claim 1, and for the additional features recited therein.

Claim 13 is patentable over Mori, Bowron and any proper combination thereof for at least similar reasons as provided above for claim 1 and for the features recited therein. Namely, claim 13 is patentable over Mori, Bowron and any proper combination thereof at least because this claim recites an illumination system including, *inter alia*, an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Accordingly, reconsideration and withdrawal of the rejection of claims 1-3 and 13 under 35 U.S.C. §103(a) based on Mori in view of Bowron are respectfully requested.

Claims 2-3, 5-12 and 17-20 were rejected under 35 U.S.C. §103(a) based on Nishi in view of Willson *et al.* (U.S. Patent No. 6,102,554) (hereinafter “Willson”). The rejection is respectfully traversed.

Claims 2-3 and 5-12 are patentable over Nishi at least by virtue of their dependency from claim 1, and for the additional features recited therein. Namely, claims 2-3 and 5-12 are patentable over Nishi at least because these claims recite a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

The cited portions of Willson fail to remedy the deficiencies of Nishi, as explained in Applicant’s previously filed Responses. The cited portions of Willson merely disclose an apparatus for modifying a light beam. Thus, any proper combination of Nishi and Willson cannot result, in any way, in the invention of claims 2-3 and 5-12.

Similarly, claims 17-20 are patentable over Nishi at least by virtue of their dependency from claim 13, and for the additional features recited therein. Namely, claims 17-20 are patentable over Nishi at least because these claims recite an illumination system including a reflective integrator disposed along an optical axis, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-

section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Any proper combination of Nishi and Willson cannot result, in any way, in the invention of claims 17-20.

Accordingly, reconsideration and withdrawal of the rejection of claims 2-3, 5-12 and 17-20 under 35 U.S.C. §103(a) based on Nishi in view of Willson are respectfully requested.

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975 under our order no. 081468/0309024. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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